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Abstract for an Invited Paper
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Spin correlations in nanostructured high-anisotropy magnetic materials.[1]

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The discovery and design of new complex materials with significant physical properties is a central issue in condensed matter and materials physics. This is especially true in the case of magnetic materials because of their important applications in energy and information-processing systems. Two parallel developments recently have provided impetus for progress, viz., computational studies predicting the structures and properties of complex ordered and disordered structures, and synthesis of such structures by non-equilibrium methods. This talk will focus on recent research directed towards the discovery of new materials with high magnetic anisotropy and high magnetization. Nanoscale and nanostructured magnets including spin correlations and exchange interactions will be discussed, with examples taken from our recent work on new phases and structures such as Co_2Si[1], Mn_5Si_3[2], Co_3Si[3], $HfCo_1$ and Zr_2Co_{11}[4], and $Fe_{3+x}Co_{3-x}X_2$ (X = Ti, Nb) [5]. This research was done in collaboration with R. Skomski, B. Balasubramanian, W. Zhang, B. Das, Y. Jin, X. Xu, P. Manchanda G. Hadjipanayis. [1] B. Balasubramanian et al., Appl. Phys. Lett. 106, 242401 (2015). [2] B. Das et al., Nano Lett. 16, 1132 (2016). [3] B. Balasubramanian et al., Appl. Phys. Lett. 108, 152406 (2016). [4] X. Zhao et al., Phys. Rev. Lett. 112, 045502 (2014); B. Balasubramanian et al., J. Phys. Cond. Matt. 26, 064204 (2014). [5] J. Zhang et al., J. Phys. D. 49, 175002 (2016); APL Mater. (in press); J. Phys. D. (in press).

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